(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
8 March 2001 (08.03.2001)

PCT

(10) International Publication Number
WO 01/16880 A2

(51) International Patent Classification[7]: G06N 3/00

(21) International Application Number: PCT/BE00/00099

(22) International Filing Date: 30 August 2000 (30.08.2000)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:

60/151,947	30 August 1999 (30.08.1999)	US
0008985.4	13 April 2000 (13.04.2000)	GB
0015526.7	26 June 2000 (26.06.2000)	GB

(71) Applicant *(for all designated States except US)*: SYNES NV [BE/BE]; Technologielaan 11, B-3001 Leuven (BE).

(72) Inventor; and

(75) Inventor/Applicant *(for US only)*: VAN HULLE, Marc [BE/BE]; Hoefstadstraat 72, B-3600 Genk (BE).

(74) Agents: BIRD, William, E. et al.; Bird Goën & Co, Vilvoordsebaan 92, B-3020 Winksele (BE).

(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

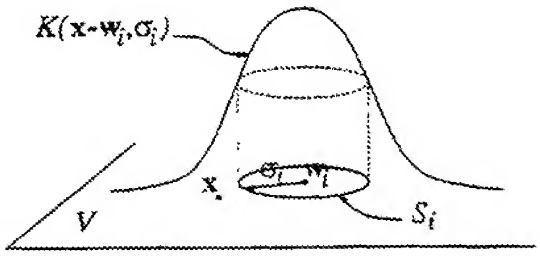
(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published:

— *Without international search report and to be republished upon receipt of that report.*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: TOPOGRAPHIC MAP AND METHODS AND SYSTEMS FOR DATA PROCESSING THEREWITH



(57) Abstract: An unsupervised competitive learning rule for equiprobabilistic topographic map formation, called the kernel-based Maximum Entropy learning Rule (kMER) is described for execution by a neural network as well as systems, especially distributed processing systems for carrying out the rule. Since kMER adapts not only the neuron weights but also the radii of the kernels centered at these weights, and since these radii are updated so that they model the local input density at convergence, these radii can be used directly, in variable kernel density estimation. The data density function at any neuron is assumed to be convex and a cluster of related data comprises one or more neurons. The data density function may have a single radius, e.g. a hypersphere. A processing engine and a method for developing a kernel-based topographic map which is then used in data model-based applications are also described. The receptive field of each kernel is disjunct from the others, i.e. overlapping. The engine may include a tool for self-organising and unsupervised learning, a monitoring tool for maximising the degree of topology achieved, for example, by using the overlapping kernels, and a tool for automatically adjusting the kernel widths to achieve equiprobabilism. Applications include variable kernel density estimation with the equiprobabilistic topographic maps, with density based cluster maps and with equiprobabilistic variable kernel-based regression. The receptive fields of the kernels may be convex, e.g. hyperspheroids or hyperspheres.

WO 01/16880 A2